Remarks

This Application has been carefully reviewed in light of the Office Action mailed December 14, 2004. Applicant appreciates the Examiner's consideration of the Application. Applicant has amended Claims 1, 11, 17, and 23 in order to advance prosecution of this Application. These amendments are not necessary for patentability. Applicant respectfully requests reconsideration and allowance of all pending claims.

Section 112, first paragraph rejections.

The Examiner rejects Claims 1-23 under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. Specifically, the Examiner asserts that there is no sufficient teaching in the specification that would allow a skilled artisan to realize the limitation "calculating a value for each variable of each cell," recited in independent Claims 1, 11, 17, and 23 (Office Action, page 3).

Amended Claim 1 now recites, in part:

at each of a predetermined plurality of steps, using a computerized computational fluid dynamics (CFD) solver to calculate a value for each variable associated with each cell based at least on a previous value calculated at the previous step for that variable associated with that cell by applying a flow field function to the previous value, at least a portion of the calculated values being calculated based at least on the set of electronically determined initial conditions;

Amended independent Claims 11, 17, and 23 recite similar limitations.

Thus, the amended claims recite that values are calculated at each step "using a computerized computational fluid dynamics (CFD) solver" and "based at least on a previous value calculated at the previous step for that variable associated with that cell by applying a flow field function to the previous value." This step is sufficiently described in the Specification at, for example, Page 8, line 25 to Page 9, line 5:

Flow field modules 115, such as a time-accurate module 116 and a time-warped module 118 coupled to grid adapter 114, calculate the values q_{kt} for the variables $Q_k(t)$ in order to determine a flow field at time t. Time-accurate module 116 and time-warped module 118 calculate the values by

applying flow field functions, such as Navier-Stokes flow field equations, to values in a time t to determine the values at a time t+1. Flow field modules 115 include computational fluid dynamics (CFD) software such as FLUENT, by FLUENT, INC.

The functionality of such computational fluid dynamics (CFD) software, including the computation of fluid flow variables, is well known in the art. Therefore, Applicant submits that the Specification is sufficient to enable one having ordinary skill in the art to make and/or use the claimed invention. For at least these reasons, Applicant respectfully requests that the Examiner withdraw his rejection of the claims under 35 U.S.C. § 112, first paragraph.

Section 112, second paragraph rejections.

The Examiner rejects Claims 1-23 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

First, the Examiner asserts that, in the case of Claim 1, it is unclear "what limitations, or process is used to ultimately determine an 'unsteady' flow field" (Office Action, Pages 4-5). As amended, Claim 1 does not recite an "unsteady" flow field. Amended Claim 1 recites, in part:

> at each of a predetermined plurality of steps, using a computerized computational fluid dynamics (CFD) solver to calculate a value for each variable associated with each cell based at least on a previous value calculated at the previous step for that variable associated with that cell by applying a flow field function to the previous value, at least a portion of the calculated values being calculated based at least on the set of electronically determined initial conditions;
> electronically recording the values calculated at periodic ones of the plurality of steps such that the values calculated at only a portion of the steps are recorded;
> electronically averaging the values recorded at the periodic steps for each variable of each cell to yield an averaged value for each variable; and
> determining the flow field from the averaged values.

Applicant submits that amended Claim 1 particularly points out and distinctly claims the subject matter which Applicant regards as the invention. Thus, Applicant respectfully

requests that the Examiner withdraw this rejection of Claim 1 under 35 U.S.C. § 112, second paragraph.

Second, the Examiner asserts that, in the case of Claims 11 and 23, "it is unclear specifically what <u>simulation process</u> is applied to the <u>adjusted values</u>. Is this process simply the combined execution of the Pro/ENGINEER and FLUENT software indicated on page 9, line 2 of the specification?" (Office Action, Pages 4-5). Applicant does not necessarily agree with the Examiner's characterization of the claims. Applicant submits that the Specification provides sufficient detail to enable one having ordinary skill in the art to understand the limitation "applying a simulation process to the adjusted values." (*See, e.g.*, Page 13, line 31 to Page 14, line 7.) Thus, amended Claims 11 and 23 particularly point out and distinctly claim the subject matter which Applicant regards as the invention. For at least this reason, Applicant respectfully requests that the Examiner withdraw this rejection of Claims 11 and 23 under 35 U.S.C. § 112, second paragraph.

Third, the Examiner asserts that, in the case of Claim 17, "it is unclear how the claimed flow field and averaging modules are realized. Are these modules simply the implementation of the FLUENT and FIELD VIEW software indicated on page 10, line 22 of the specification?" (Office Action, Pages 6). Applicant does not necessarily agree with the Examiner's characterization of the claims. Claim 17 has been amended to recite, in part:

> a grid generator electronically generating a grid comprising a plurality of cells, each cell associated with a set of variables describing a portion of the flow field at that cell;
> a flow field module coupled to the grid generator, the flow field module using a computerized computational fluid dynamics (CFD) solver to calculate, at each of a predetermined plurality of steps, a value for each variable associated with each cell based at least on a previous value calculated at the previous step for that variable associated with that cell;
> a recording module operable to electronically record the values calculated at periodic ones of the plurality of steps such that the values calculated at only a portion of the steps are recorded; and
> an averaging module coupled to the flow field module, the averaging module electronically averaging the values recorded at the periodic steps for each variable to yield an averaged value for each variable.

Applicant submits that amended Claim 17 particularly points out and distinctly claims

the subject matter which Applicant regards as the invention. For at least these reasons, Applicant respectfully requests that the Examiner withdraw this rejection of Claim 17 under 35 U.S.C. § 112, second paragraph.

Section 102 Rejections.

The Examiner rejects Claims 1, 5, 17, and 22 under 35 U.S.C. § 102(b) as being anticipated by "UFAT - A Particle Tracer for Time-Dependent Flow Fields" (hereinafter, "*UFAT*") published in 1994. Applicant respectfully traverses this rejection in view of the amendments to the claims shown above and the following comments.

Claim 1, as amended, recites:

> A method for simulating a flow field, the method comprising:
> receiving a set of user inputs associated with a flow field;
> electronically determining a set of initial conditions for the flow field based at least on the received set of user inputs;
> electronically generating a grid comprising a plurality of cells, each cell associated with a set of variables describing a portion of the flow field at that cell;
> at each of a predetermined plurality of steps, using a computerized computational fluid dynamics (CFD) solver to calculate a value for each variable associated with each cell based at least on a previous value calculated at the previous step for that variable associated with that cell by applying a flow field function to the previous value, at least a portion of the calculated values being calculated based at least on the set of electronically determined initial conditions;
> electronically recording the values calculated at periodic ones of the plurality of steps such that the values calculated at only a portion of the steps are recorded;
> electronically averaging the values recorded at the periodic steps for each variable of each cell to yield an averaged value for each variable; and
> determining the flow field from the averaged values.

UFAT fails to disclose, teach, or suggest these limitations. For example, *UFAT* fails to disclose, teach, or suggest:

> at each of a predetermined plurality of steps, using a computerized computational fluid dynamics (CFD) solver to calculate a value for each variable associated with each cell . . .

electronically recording the values calculated at periodic ones of the plurality of steps such that the values calculated at only a portion of the steps are recorded;

electronically averaging the values recorded at the periodic steps for each variable of each cell to yield an averaged value for each variable; and determining the flow field from the averaged values.

In other words, *UFAT* does not teach or suggest recording CFD-calculated values for fluid flow variables *only at periodic steps* such that the only values calculated a portion of the steps are recorded, averaging such recorded values to obtain average values for each variable, and determining a flow field from such averaged values. The portions of *UFAT* cited by the Examiner regarding the steps of applying a flow field function and determining average values (page 260, col. 2, para:1; and page 261, col. 1, para:1, 5.3) clearly do not teach or suggest such steps. For example, these cited portions of *UFAT* disclose nothing about averaging periodically recorded values, as recited in amended Claim 1.

For at least these reasons, Applicant respectfully requests reconsideration and allowance of amended independent Claim 1, together with Claim 5 that depends from Claim 1. In addition, for analogous reasons, Applicant respectfully requests reconsideration and allowance of amended independent Claim 17, together with Claim 22 that depends from Claim 17.

Section 103 Rejections.

Claims 2-4, 6-16, 18-21, and 23 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *UFAT* in view of "An Implicit Upward Algorithm for Computing Turbulent Flows of Unstructured Grids," by W.K. Anderson et al., Computer Fluids, Vol. 23, No. 1, pp. 1-21, 1994 (hereinafter, *Anderson*).

Applicant respectfully requests the Examiner withdraw these rejections of the claims under 35 U.S.C. §103(a), at least because neither *UFAT* nor *Anderson*, whether considered alone or in combination, recites the combination of limitations recited in the claims as currently amended.

For example, neither *UFAT* nor *Anderson*, whether considered alone or in combination, disclose, teach, or suggest the following limitations recited in amended Claim 1, from which Claims 2-4 and 6-10 depend:

> at each of a predetermined plurality of steps, using a computerized computational fluid dynamics (CFD) solver to calculate a value for each variable associated with each cell . . .
> electronically recording the values calculated at periodic ones of the plurality of steps such that the values calculated at only a portion of the steps are recorded;
> electronically averaging the values recorded at the periodic steps for each variable of each cell to yield an averaged value for each variable; and
> determining the flow field from the averaged values.

First, *UFAT* fails to disclose, teach, or suggest these limitations, as discussed above regarding the rejections of the claims under 35 U.S.C. § 102(b). *Anderson* also fails to teach or suggest these limitations, and the Examiner has not asserted that *Anderson* teaches or suggests such limitations. If the Examiner believes that either *UFAT* or *Anderson* does in fact teach such limitations, Applicant requests that the Examiner point out with sufficient detail the particular text which the Examiner believes teaches such limitations.

For at least these reasons, Applicant respectfully requests reconsideration and allowance of Claims 2-4 and 6-10. In addition, for analogous reasons, Applicant respectfully requests reconsideration and allowance of Claims 11-16, 18-21, and 23.

Conclusion

Applicant has made an earnest attempt to place this case in condition for allowance. For the foregoing reasons, and for other reasons clearly apparent, Applicant respectfully requests full allowance of all pending claims.

If the Examiner believes a telephone conference would advance prosecution of this case in any way, the Examiner is invited to contact Keiko Ichiye, Attorney for Applicant, at the Examiner's convenience at (214) 953-6494.

Although Applicant believes no fees are due, the Commissioner is hereby authorized to charge any fees or credit any overpayments to Deposit Account No. 02-0384 of Baker Botts L.L.P.

Respectfully submitted,

BAKER BOTTS L.L.P.
Attorneys for Applicant

Keiko Ichiye
Reg. No. 45,460

Date: March 14, 2005

Correspondence Address:

Customer No. **05073**